

CLAIMS

We claim:

1. A method in a wearable computer for providing information about a current state of a user of the wearable computer, the current state modeled with multiple state attributes, the wearable computer having a plurality of input sensors and executing a plurality of state server modules to supply values for the state attributes, executing a plurality of state client modules to receive and process values for the state attributes, and executing an intermediary module to facilitate exchange of state attribute values, the method comprising:

under control of each of the executing state server modules, repeatedly monitoring the modeled current state of the user by,

receiving information from at least one of the input sensors; and

generating a current value for at least one state attribute of the user from the received information;

under control of each of the executing state client modules, sending to the intermediary module an indication of a state attribute of the user of interest; and

under control of the intermediary module, for each executing state client module,

receiving from the state client module the indication of the state attribute;

receiving from at least one of the state server modules a generated current value for the indicated state attribute; and

sending an appropriate value for the indicated state attribute to the state client module by,

when a single generated current value for the indicated state attribute is received, sending the single value to the state client module;

when multiple generated current values for the indicated state attribute are received from a single state server module, sending a most recently generated of the multiple received values to the state client module; and

when multiple generated current values for the indicated state attribute are received from multiple state server modules, sending to the state client module one of the multiple received values selected based on accuracy and recency of the selected value.

2. The method of claim 1 wherein the sending of the appropriate values to the state client modules is in response to the receiving of the generated current values from at least one of the state server modules.

3. The method of claim 1 wherein the sending of the appropriate values to the state client modules is in response to the receiving of the indication of the state attribute from the state client module.

4. The method of claim 3 including, after the receiving of the indication of the state attribute and before the sending of the appropriate value in response:

determining whether any previously received generated values for the indicated state attribute are sufficiently accurate and recent to be appropriate; and

when it is determined that no previously received generated values for the indicated state attribute are sufficiently accurate and recent to be appropriate, requesting the at least one state server module to supply an updated generated value for the indicated state attribute.

5. The method of claim 1 wherein each state client module has a user and including, for each state client module:

receiving the sent appropriate value from the intermediary module; and

presenting information to the user of the state client module based on the receiving of the sent appropriate value.

6. The method of claim 1 wherein the state server modules additionally generate current values for additional state attributes of a current state other than for the user, and wherein the intermediary module additionally sends appropriate values for the additional state attributes to state client modules based on received indications of the additional state attributes from the state client modules.

7. The method of claim 1 wherein the selecting of a received generated value based on the accuracy and the recency of the value includes determining whether the value has an associated effective time that is less than an indicated recency threshold and determining whether the value has an associated accuracy indication that is greater than an indicated accuracy threshold.

8. A computer-implemented method for providing mediated information about a current state that is modeled with multiple state attributes, comprising:

receiving from a first source an indication of a first value for an indicated one of the state attributes of the modeled current state;

receiving from a second source an indication of a second value for the indicated state attribute; and

after an indication from a client for a value for the indicated state attribute, sending to the client a mediated value for the indicated state attribute that is produced by mediating between available values for the indicated state attribute including at least the first and second values.

9. The method of claim 8 wherein the indicated state attribute represents information about a user of the computer.

10. The method of claim 9 wherein the represented information reflects a modeled mental state of the user.

11. The method of claim 8 wherein the indicated state attribute represents information about a physical environment of a user of the computer.

12. The method of claim 8 wherein the indicated state attribute represents information about a cyber-environment of a user of the computer.

13. The method of claim 8 wherein the indicated state attribute represents information about the computer.

14. The method of claim 8 wherein the indicated state attribute represents a current prediction about a future state.

15. The method of claim 14 wherein the client indication is an indication of an interest in receiving values for the indicated state attribute, and wherein the produced mediated value is pushed to the client in response to the receiving of at least one of the first and second values.

16. The method of claim 14 wherein the client indication is a request for the value for the indicated state attribute, and including requesting the first and second sources to supply the first and second values in response to the receiving of the request.

17. The method of claim 8 wherein the client indication is a request for the value for the indicated state attribute, and wherein the sending of the produced mediated value is in response to the receiving of the request.

18. The method of claim 8 wherein the client indication is a request for the value for the indicated state attribute, and including, after receiving the request from the client and before the sending of the produced mediated value:

determining for each of the first and second values whether the value satisfies an indicated criteria; and

when it is determined that neither of the first and second values satisfy the indicated criteria,

requesting at least one of the first and second sources to supply a value for the indicated state attribute that satisfies the indicated criteria;

receiving in response to the requesting at least one additional value for the indicated state attribute that satisfies the indicated criteria; and

producing the value to be sent to the client by mediating between the received additional values.

19. The method of claim 18 wherein the criteria is indicated by the client.

20. The method of claim 18 wherein the criteria for the value is based on precision of the value.

21. The method of claim 18 wherein the criteria for the value is based on recency of generation of the value.

22. The method of claim 18 wherein the criteria for the value is based on recency of receipt of the value.

23. The method of claim 18 wherein the criteria for the value is based on accuracy of the value.

24. The method of claim 8 wherein the available values include a plurality of additional values for the indicated state attribute that are received from a plurality of sources.

25. The method of claim 8 wherein the produced mediated value is the first value, and wherein the sending of the produced mediated value to the client includes

sending an indication of the source from which the produced mediated value was received.

26. The method of claim 8 wherein the sending of the produced mediated value to the client includes sending an indication of a mediator type used for the mediating.

27. The method of claim 8 including producing the mediated value to be sent by mediating between the available values for the indicated state attribute based on an indication from a mediation mechanism.

28. The method of claim 27 wherein the client is the first source, and wherein after receiving the sent mediated value the client uses the received value to produce a new value for one of the state attributes.

29. The method of claim 27 wherein the mediation mechanism includes a group of instructions to be executed to perform the mediating.

30. The method of claim 29 including loading and executing the group of instructions in response to receiving of the client indication.

31. The method of claim 27 wherein the first source includes a group of instructions to be executed to produce the first value, and including loading and executing the group of instructions in response to receiving of the client indication so that the first source can produce the first value.

32. The method of claim 27 including maintaining a rating for each source based on at least one indicated rating factor, and wherein the mediation mechanism indicates to select an available value from a source with a highest rating.

33. The method of claim 27 wherein the available values for the indicated state attribute have a designated order, and wherein the mediation mechanism indicates to select an available value that is first in the designated order.

34. The method of claim 27 wherein the available values for the indicated state attribute have a designated order, and wherein the mediation mechanism indicates to select an available value that is last in the designated order.

35. The method of claim 27 wherein the mediation mechanism indicates to select a generated average of the available values.

36. The method of claim 27 including, before the receiving of the first and second values, receiving a registration message from each of the first and second sources indicating an availability to supply values for the indicated state attribute, and wherein the mediation mechanism indicates to select a value supplied by a source whose registration message was first received.

37. The method of claim 27 wherein the mediation mechanism indicates to indicate each of the available values to a user and to select the produced mediated value based on selection by the user of one of the indicated available values.

38. The method of claim 27 wherein the mediation mechanism indicates to select an available value from a source whose values are most consistent over time.

39. The method of claim 27 wherein the available values have multiple associated properties, and wherein the mediation mechanism indicates to select an available value based on at least one indicated property.

40. The method of claim 27 wherein the mediation mechanism indicates to select the available value that is most recently received.

41. The method of claim 27 wherein the mediation mechanism indicates to select the available value that is most recently produced by the source from which the value was received.

42. The method of claim 27 wherein the mediation mechanism indicates to select an available value that is received from a source with a highest value resolution capability.

43. The method of claim 27 wherein the mediation mechanism indicates to select an available value that is received from a source with a highest value precision capability.

44. The method of claim 27 wherein the mediation mechanism indicates to select a generated weighted average of the available values using an indicated weighting mechanism.

45. The method of claim 27 wherein the mediation mechanism indicates to select a generated aggregation of the available values.

46. The method of claim 27 wherein the mediation mechanism indicates to select a most frequently occurring value among the available values.

47. The method of claim 27 including, before the receiving of the first and second values, requesting the first and second sources to supply values for the indicated state attribute, and wherein the mediation mechanism indicates to select a value received first in response to the requesting.

48. The method of claim 27 wherein each of the available values has an associated confidence factor indicating a likelihood of accuracy of the value, and wherein

the mediation mechanism indicates to select the available value with the highest associated confidence factor.

49. The method of claim 27 wherein the mediation mechanism indicates to select an available value from a source that is certified by a third party.

50. The method of claim 27 wherein the mediation mechanism indicates to select an available value from a source that is in a group of at least one preferred source.

51. The method of claim 27 wherein the mediation mechanism indicates to select an available value from a most recently generated source.

52. The method of claim 27 including receiving from the client an indication of a source, and wherein the mediation mechanism indicates to select an available value received from the indicated source.

53. The method of claim 27 including selecting the mediation mechanism to assist in the mediating based on feedback from previous uses of the mediation mechanism.

54. The method of claim 27 including selecting the mediation mechanism to assist in the mediating based on cost of the mediation mechanism.

55. The method of claim 27 wherein the mediation mechanism is a default mediation mechanism for the indicated state attribute.

56. The method of claim 27 including selecting the mediation mechanism to assist in the mediating based on a type of the client.

57. The method of claim 27 including selecting the mediation mechanism to assist in the mediating based on an indication received from the client.

58. The method of claim 27 including selecting the mediation mechanism to assist in the mediating based on an indication received from at least one of the sources of the available values.

59. The method of claim 27 including selecting the mediation mechanism to assist in the mediating based on an indication received from a third-party.

60. The method of claim 27 including receiving from the client an indication of another state attribute and an indication that a source for a value for the indicated another state attribute is to be the same source as for the produced mediated value for the indicated state attribute, and wherein a mediation mechanism indicates to select a value for the indicated another state attribute that is received from the same source so that the selected value can be sent to the client.

61. The method of claim 27 including receiving from the first source an indication of a group of at least one authorized client, and wherein the first value received from the first source is used as one of the available values for the mediating only if the client is one of the authorized clients.

62. The method of claim 27 including generating at least one of the available values for the indicated state attribute.

63. The method of claim 27 including receiving a group of instructions for the mediation mechanism that when executed produces the indication from the mediation mechanism.

64. The method of claim 8 wherein receiving of the sent mediated value by the client prompts the client to present information to a user of the client.

65. The method of claim 8 including receiving another value for the indicated state attribute after the sending of the mediated value, and when it is determined that the another value is more appropriate than the sent mediated value, sending the another value to the client.

66. A computer-readable medium whose contents cause a computing device to provide mediated information about a current state that is modeled with multiple state attributes, by:

receiving from a first source an indication of a first value for an indicated one of the state attributes of the modeled current state;

receiving from a second source an indication of a second value for the indicated state attribute; and

after an indication for a value for the indicated state attribute, producing a mediated value for the indicated state attribute by mediating between available values for the indicated state attribute including at least the first and second values.

67. A computer-readable generated data signal transmitted via a transmission medium, the generated data signal having encoded contents that cause a computer system to provide mediated information about a current state that is modeled with multiple state attributes, by:

receiving from a first source an indication of a first value for an indicated one of the state attributes of the modeled current state;

receiving from a second source an indication of a second value for the indicated state attribute; and

after an indication from a client for a value for the indicated state attribute, sending to the client a mediated value for the indicated state attribute that is produced by

mediating between available values for the indicated state attribute including at least the first and second values.

68. A computer system for providing mediated information about a current state that is modeled with multiple state attributes, comprising:

a first module capable of receiving from a first source an indication of a first value for an indicated one of the state attributes of the modeled current state, and of receiving from a second source an indication of a second value for the indicated state attribute; and

a second module capable of, after an indication from a client for a value for the indicated state attribute, sending to the client a mediated value for the indicated state attribute that is produced by mediating between available values for the indicated state attribute including at least the first and second values.

69. A computer system for providing mediated information about a current state that is modeled with multiple state attributes, comprising:

means for receiving from a first source an indication of a first value for an indicated one of the state attributes of the modeled current state and for receiving from a second source an indication of a second value for the indicated state attribute; and

means for, after an indication from a client for a value for the indicated state attribute, sending to the client a mediated value for the indicated state attribute that is produced by mediating between available values for the indicated state attribute including at least the first and second values.

70. A computer-implemented method for processing mediated information about a current state that is modeled with multiple state attributes, each of the state attributes having multiple sources available to supply values for the attribute, comprising:

sending to an intermediary module an indication of one of the state attributes;

receiving from the intermediary module a mediated value for the indicated state attribute, the mediated value based on multiple available values for the attribute from multiple sources; and

using the received mediated value to perform processing based on the modeled current state.

71. The method of claim 70 wherein the processing based on the received mediated value includes presenting information to a user.

72. The method of claim 70 including sending to the intermediary module an indication of a mediator to be used for the mediating.

73. The method of claim 70 including sending to the intermediary module an executable mediator to be used for the mediating.

74. The method of claim 70 including sending to the intermediary module an indication of a source such that the received mediated value is to be based at least in part on a value received from the indicated source.

75. A computer-readable medium containing instructions that when executed cause a computing device to process mediated information about a current state that is modeled with multiple state attributes, each of the state attributes having multiple sources available to supply values for the attribute, by:

sending to an intermediary module an indication of one of the state attributes;

receiving from the intermediary module a mediated value for the indicated state attribute, the mediated value based on multiple available values for the attribute from multiple sources; and

using the received mediated value to perform processing based on the modeled current state.

76. A computer system for processing mediated information about a current state that is modeled with multiple state attributes, each of the state attributes having multiple sources available to supply values for the attribute, comprising:

a first module capable of sending to an intermediary module an indication of one of the state attributes;

a second module capable of receiving from the intermediary module a mediated value for the indicated state attribute, the mediated value based on multiple available values for the attribute from multiple sources; and

a third module capable of using the received mediated value to perform processing based on the modeled current state.

77. A computer-implemented method for providing mediated information about a current state that is modeled with multiple state attributes, each of the state attributes having multiple sources available to supply values for the attribute, comprising:

receiving from an intermediary module an indication of one of the state attributes;

receiving input information about the modeled current state;

generating a value for the indicated state attribute based at least in part on the received input information; and

sending to the intermediary module an indication of the generated value, so that the intermediary module can produce for clients a mediated value for the indicated state attribute based at least in part on the generated value.

78. The method of claim 77 wherein the input information is received from a sensor.

79. A computer-readable medium whose contents cause a computing device to provide mediated information about a current state that is modeled with

multiple state attributes, each of the state attributes having multiple sources available to supply values for the attribute, by:

receiving from an intermediary module an indication of one of the state attributes;

receiving input information about the modeled current state;

generating a value for the indicated state attribute based at least in part on the received input information; and

sending to the intermediary module an indication of the generated value, so that the intermediary module can produce for clients a mediated value for the indicated state attribute based at least in part on the generated value.

80. A computer system for providing mediated information about a current state that is modeled with multiple state attributes, each of the state attributes having multiple sources available to supply values for the attribute, comprising:

a first module capable of receiving from an intermediary module an indication of one of the state attributes; and

a second module capable of receiving input information about the modeled current state, generating a value for the indicated state attribute based at least in part on the received input information, and sending to the intermediary module an indication of the generated value,

so that the intermediary module can produce for clients a mediated value for the indicated state attribute based at least in part on the generated value.

81. A method in a portable computer for providing mediated information about a context of a user of the computer, the portable computer being transported with the user, the state represented with multiple state attributes and varying with location of the user, comprising:

while the user is at a first location and has a first state based at least in part on the first location, receiving from a first source an indication of a first value for an indicated one of the attributes; and

while the user is at a second location and has a second state based at least in part on the second location,

receiving from a second source an indication of a second value for the indicated attribute; and

after an indication from a client for a value for the indicated attribute,

producing a mediated value for the indicated attribute based on at least the first and second values; and

sending the produced mediated value to the client.

82. The method of claim 81 wherein the first source is at the first location and is remote from the portable computer, wherein the received first value is based on the first location, and wherein the mediated value produced while the user is at the second location is the second value.

83. The method of claim 81 wherein the first source is part of the portable computer, and including receiving from the first source while the user is at the second location an indication of a third value for the indicated attribute such that the producing of the mediated value is additionally based on the third value.

84. The method of claim 81 wherein the first source is remote from the portable computer and the first location, and including receiving from the first source while the user is at the second location an indication of a third value for the indicated attribute such that the producing of the mediated value is additionally based on the third value.

85. A computer-implemented method for providing mediated information about a current context that is represented with multiple context attributes, comprising:

receiving from each of multiple sources a value for an indicated one of the context attributes of the current context;

storing the received values;

after the storing, receiving a request from a client for a value for the indicated context attribute; and

in response to the receiving of the request,

determining for each of the stored received values whether the value satisfies a criteria indicated for the requested value;

when it is determined that none of the stored values satisfy the criteria,

requesting at least one source to supply a value for the indicated context attribute that satisfies the criteria;

receiving in response to the requesting at least one additional value for the indicated context attribute that satisfies the criteria; and

sending to the client a value for the indicated context attribute that satisfies the criteria and that is produced by mediating between at least the received additional values; and

when at least one of the stored values is determined to satisfy the criteria, sending to the client a value for the indicated context attribute that satisfies the criteria and that is produced by mediating between the values determined to satisfy the criteria.

86. The method of claim 85 including, for each of the additional values that is received from one of the multiple sources, replacing the stored value previously received from that one source with the additional value received from that one source.

87. The method of claim 85 wherein the criteria is indicated by the client.

88. The method of claim 85 wherein the mediating includes using an indicated mediator.